Selecting Models and Methods For Planning Ecosystem Restoration Projects:

A Reference for USACE Civil Works

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THE PROTOCOL INTENT & ORGANIZATION:

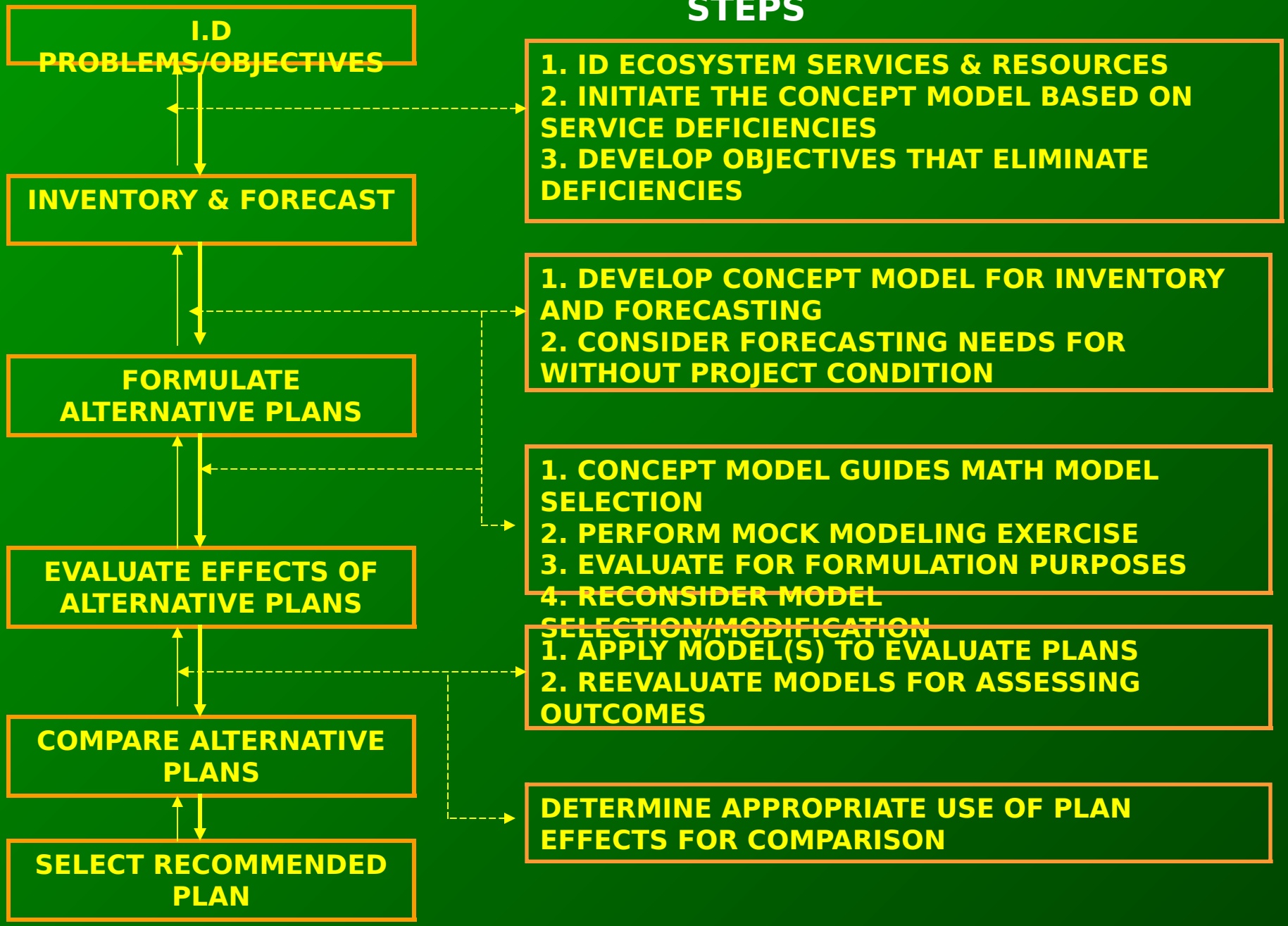
- Informs model selection for restoration project planning
- It is a draft in refinement phase.
- The protocol stems from new policy and planning complexity
  - National ecosystem restoration (NER)
  - Environmental Operating Principles,
  - NER/NED multi-purpose planning for sustainability
- It is more descriptive and adaptive than prescriptive and fixed

THE PROTOCOL SERVES SEVERAL PLANNING NEEDS:

- Identifying and defining project problems & objectives
- Organizing cause-and-effect understanding into inventory
- Analyzing forecasts of without-project effects
- Analyzing forecasts of project plan effects
- Identifying limits to understanding, uncertainty, risk
- Communicating project understanding to all stakeholders

CW PROJECT PLANNING

MODEL SELECTION STEPS


I.D PROBLEMS/OBJECTIVES
1. ID ECOSYSTEM SERVICES & RESOURCES
2. INITIATE THE CONCEPT MODEL BASED ON SERVICE DEFICIENCIES
3. DEVELOP OBJECTIVES THAT ELIMINATE DEFICIENCIES
INVENTORY & FORECAST
1. DEVELOP CONCEPT MODEL FOR INVENTORY AND FORECASTING
2. CONSIDER FORECASTING NEEDS FOR WITHOUT PROJECT CONDITION
FORMULATE ALTERNATIVE PLANS
1. CONCEPT MODEL GUIDES MATH MODEL SELECTION
2. PERFORM MOCK MODELING EXERCISE
3. EVALUATE FOR FORMULATION PURPOSES
4. RECONSIDER MODEL SELECTION/MODIFICATION
EVALUATE EFFECTS OF ALTERNATIVE PLANS
1. APPLY MODEL(S) TO EVALUATE PLANS
2. REEVALUATE MODELS FOR ASSESSING OUTCOMES
COMPARE ALTERNATIVE PLANS
DETERMINE APPROPRIATE USE OF PLAN EFFECTS FOR COMPARISON
SELECT RECOMMENDED PLAN

Planning Step 1.

Identify Problems & Opportunities

Planning Step 2.

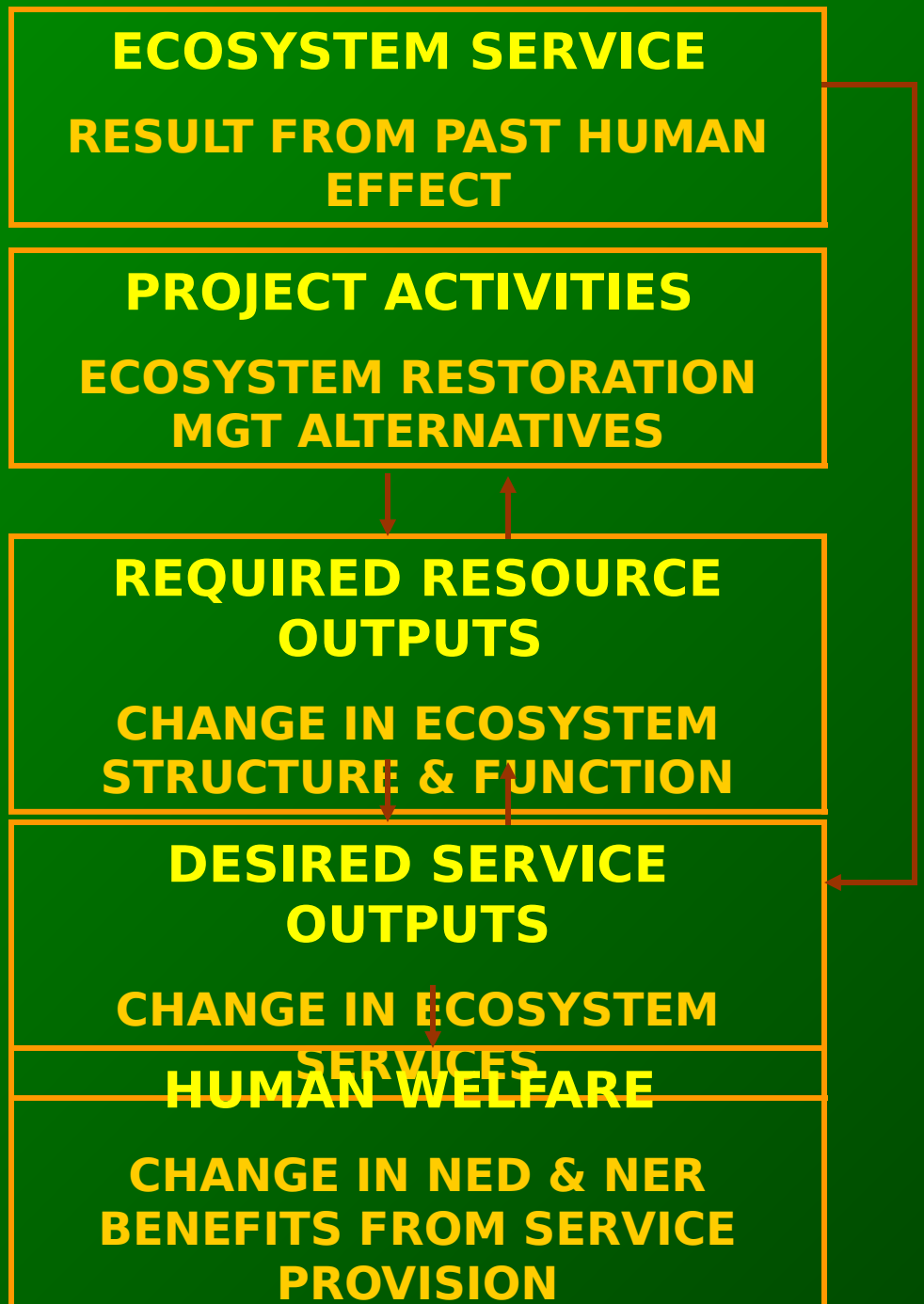
Inventory & Forecast Conditions

Model Selection Step 1

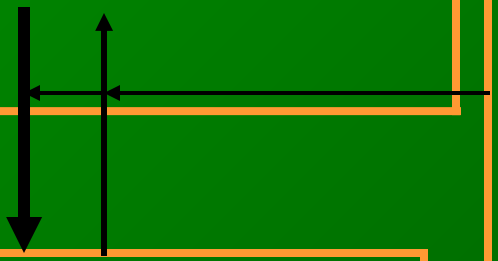
Element 1a. Identify ecosystem services and resources (both structural and functional) in the study area.

Element 1b. Initiate a concept model for identifying planning problems & opportunities based on service deficiencies caused by resource degradation

BASIC CONCEPTUAL MODEL ELEMENTS FOR SERVICE FLOWS


ECOSYSTEM SERVICE
RESULT FROM PAST HUMAN EFFECT
PROJECT ACTIVITIES
ECOSYSTEM RESTORATION MGT ALTERNATIVES
REQUIRED RESOURCE OUTPUTS
CHANGE IN ECOSYSTEM STRUCTURE & FUNCTION
DESIRED SERVICE OUTPUTS
CHANGE IN ECOSYSTEM SERVICES
HUMAN WELFARE
CHANGE IN NED & NER BENEFITS FROM SERVICE PROVISION

Planning Step 2. Inventory & Forecast Conditions



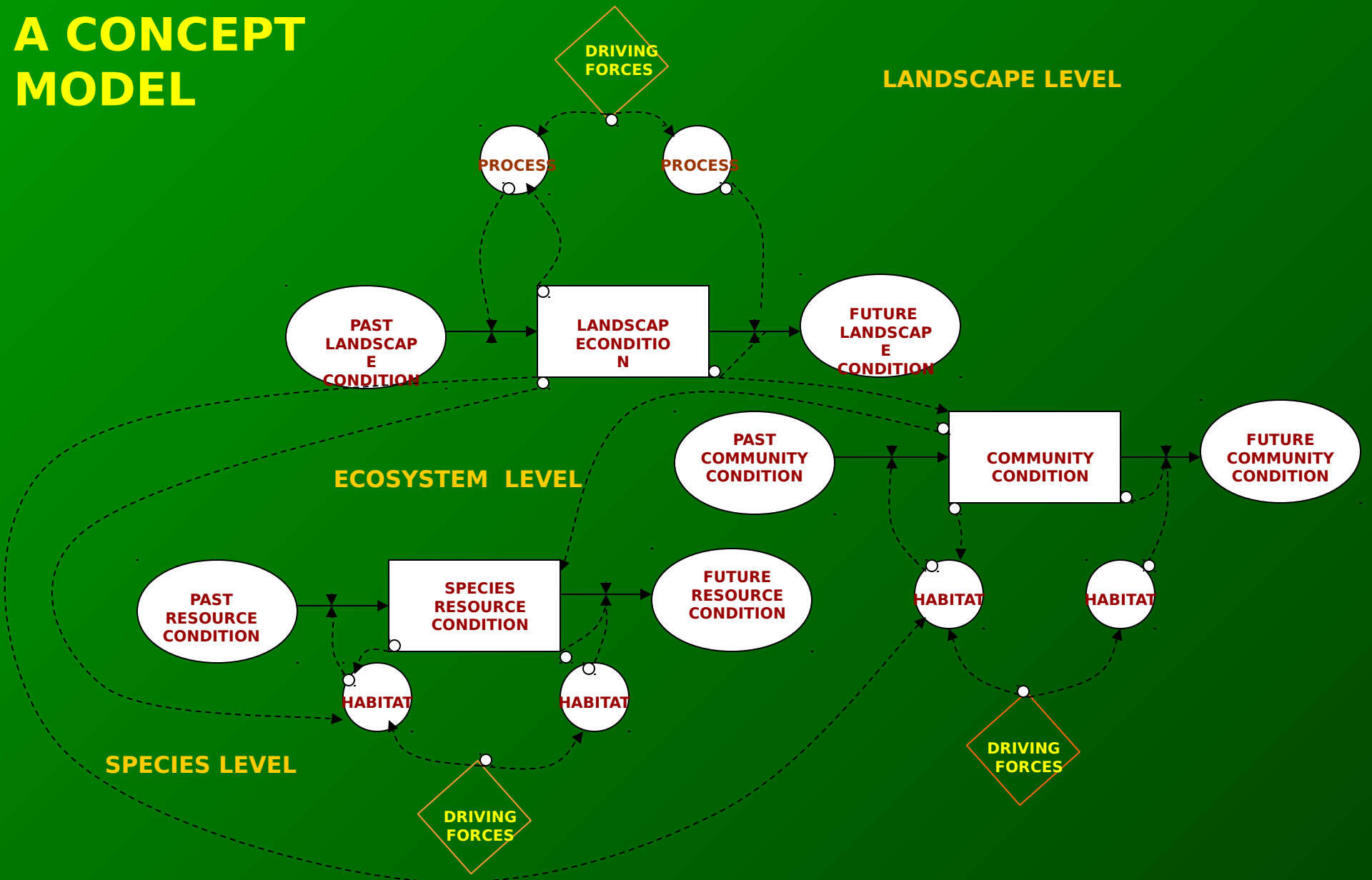
Planning Step 3. Formulate Alternatives

Model Selection Step 2

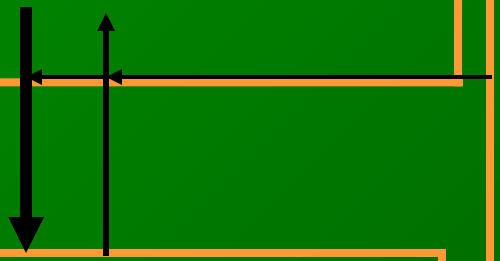
Element 2a. Further develop the concept model for project inventory and forecasting.

Element 2b. Consider forecasting needs for the without-project condition before

DIAGRAMMING A CONCEPT MODEL



Planning Step 3. Formulate Alternatives



Planning Step 4. Evaluate Effects of Alternatives

Model Selection Step 3

Element 3a. Use the concept model to guide selection or development of quantitative model(s)

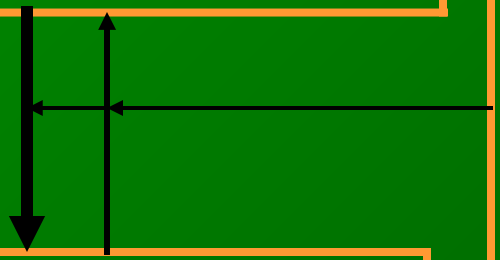
Element 3b. Perform a mock modeling exercise to assess model strengths and weaknesses

Element 3c. Evaluate the capacity of the selected model(s) to reveal the range of management

SELECTION OF MATH FORM CONSIDERS:

- Scale of resource response indicating objective--e.g.,species
- The numbers of outputs generated--many models handle one
- Completeness of project area and systems coverage
- Long-term sustainability is confidently indicated in outputs
- Compatible output form and input when models are linked

Planning Step 4. Evaluate Effects of Alternatives



Planning Step 5. Compare Alternatives

Model Selection Step 4

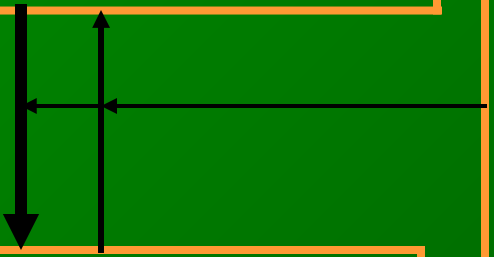
Element 4a. Apply the selected model(s) to evaluate the contribution of alternative plans to project objectives and other plan effects

Element 4b. Reevaluate the adequacy of model(s)

RESTORATION PLANNING MODELS:

- Real-world models measured directly
- Statistical models--single-output estimates best used with real-world models.
- Species-habitat models--usually single-output indices to optimal habitat
- Community-habitat models --usually single-output indices to more natural conditions
- Ecosystem functional capacity indices--multioutput indices to more natural conditions

Planning Step 4. Evaluate Effects of Alternatives



Planning Step 5. Compare Alternatives

Model Selection Step 5

Element 5. Determine appropriate use of different estimated plan effects for plan comparison.

PROJECT TYPE	MINOR INVESTMENT & PROJECT EFFECTS	MAJOR INVESTMENT & PROJECT EFFECTS
SINGLE-PURPOSE NER	CATEGORY A REAL-WORLD MODELS & ALL AFFORDABLE QUANTITATIVE MODELS E,G, 1135 AND 206	CATEGORY C PROCESS SIMULATION MODELS E.G, GI AUTHORITY
JOINTLY FORMULATED MULTI-PURPOSE NED/NER	CATEGORY B PHYSICALLY SEPARATE — MANY CHOICES SAME SPACE – PROCESS SIMULATION E.G., ALL CAPs	CATEGORY D PROCESS SIMULATION MODELS E.G, GI AUTHORITY

COMPLEXITY

PROJECT COMPLEXITY AND MODEL SELECTION CHOICE